

REMARKS

The above-identified patent application has been amended and Applicants respectfully request the Examiner to reconsider and again examine the claims as amended.

Claims 1, 4-18, 29-33, and 36-39 are pending in the application. Claims 1, 4-18, 29-33, and 36-38 are rejected. Claim 29 is amended herein. Claim 39 is new.

The Rejections under 35 U.S.C. §102(b)

The Examiner rejects Claims 29-31 under 35 U.S.C. §102(b) as being anticipated by Japanese provisional patent publication number JP 2002-40058, referred to hereafter as the 40058 publication.

Applicants submit that amended Claim 29 is patentably distinct over the 40058 publication, since the cited reference neither describes nor suggests "... a single lead frame having a plurality of leads...[and] a current conductor portion comprising a coupling of at least two of the plurality of leads...," as set forth in Claim 29. Support for this arrangement can be found in many of the figures, for example, in FIG. 1.

With this particular arrangement, the present invention conveniently provides the claimed current conductor portion as a coupling of leads of a conventional single lead frame. In contrast, the 40058 publication provides a conductor (element 4 of FIGS. 2-4), which is necessarily a separate structure apart from and separate from a conventional single lead frame, of which elements 22-25 and a support plate 21 may be parts. From FIG. 3 of the 40058 publication, it should be apparent that the conductor 4 and the leads 22-25 are in different planes. From FIG. 2 of the 40058 publication, it should be apparent that the conductor 4 overlaps the support plate 21. Therefore, Applicants submit that the conductor 4 cannot be a part of a single lead frame with the leads 22-25 and with the support plate 21.

In view of the above, Applicants submit that Claim 29 is patentably distinct over the 40058 publication.

Claims 30 and 31 depend from and thus include the limitations of Claim 29. Thus, Applicants submit that Claims 30 and 31 are patentably distinct over the cited reference at least for the reasons discussed above in conjunction with Claim 29.

Applicants submit that Claim 31 is further patentably distinct over the 40058 publication, since the cited reference neither describes nor suggests "...at least a portion of said current conductor portion has a generally T-shaped cross section," as set forth in Claim 31. The claimed T-shaped cross section is shown, for example, in FIG. 9A of the present patent application. The Examiner indicates that the claimed T-shaped cross section can be seen in FIG. 9 of the 40058 publication. However, FIG. 9 of the 40058 publication is not a cross-sectional view of the conductor 4. Applicants submit that the current conductor 4 of the 40058 publication has a uniform thickness, and therefore, a rectangular cross section, not a T-shaped cross section as claimed.

In view of the above, Applicants submit that the rejection of Claims 29-31 under 35 U.S.C. §102(b) should be removed.

The Rejections under 35 U.S.C. §103(a)

The Examiner rejects Claims 1, 4-18, 32, 33, and 36-38 under 35 U.S.C. §103(a) as being unpatentable over the 40058 publication in view of Popovic et al. (U.S. Patent number 5,247,202). The Examiner recognizes that the 40058 publication fails to teach that "each one of the leads has a bend in a direction selected to result in each one of the leads being closer to the first surface of the substrate than to the second surface of the substrate throughout the length of the lead," as set forth in Claim 1. The Examiner relies upon Popovic et al. as teaching "the use of bent leads for mounting to a circuit board." The Examiner concludes that "[i]t would have

been obvious to one of ordinary skill in the art at the time the invention was made to bend a portion of the leads of ...[the 40058 publication] for the purpose of mounting to a circuit board."

As the Examiner is aware, and as found in MPEP §2142, in order to establish a prima facie case of obviousness "...the prior art reference (or prior art references when combined) must teach or suggest all the claim limitations." Applicants respectfully submit that the Examiner has not met this burden in order to establish prima facie obviousness.

Applicants submit that Claim 1 is patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest "...each one of the leads has a bend in a direction selected to result in each one of the leads being closer to the first surface of the substrate than to the second surface of the substrate throughout the length of the lead," as set forth in Claim 1. It should be appreciated from the language of Claim 1 that the claimed first surface of the substrate is the substrate surface upon which the claimed one or more magnetic field transducer are disposed, and also the surface of the substrate closest to the current conductor portion.

The claimed direction of bend of the leads along with the claimed definition of the first surface of the substrate result in an arrangement for which the substrate, for example, the substrate 16 of FIG. 1, is mounted upside down from a conventional arrangement, i.e., with the active surface 16a (the surface supporting the magnetic field transducer 18) of the substrate 16 disposed downward and toward the lead frame 12. In a conventional arrangement, the active surface 16a is disposed upward, away from the lead frame.

In contrast, referring to FIG. 3 of the 40058 publication, the first surface (the surface supporting the Hall device 35 of FIG. 11) of the substrate 20 is downward. However, leads 22-25 are closest to the other surface, the second surface of the substrate 20.

Applicants submit that Popovic et al. fails to overcome the above deficiencies in the 40058 publication. The Examiner apparently uses Popovic et al. merely to teach bent leads. However, the bent leads must have particular characteristics as claimed, which Popovic et al. does not teach at all. In particular, each one of the claimed leads must have “...a bend in a direction selected to result in each one of the leads being closer to the first surface of the substrate than to the second surface of the substrate throughout the length of the lead.” wherein the first surface is that surface upon which the claimed one or more magnetic field transducers are disposed. In contrast, according to Fig. 2 of Popovic et al., the leads 8 are closest to a back surface a semiconductor chip 4, the surface opposite from which a Hall element is disposed, as evidenced by the bond wire 9 shown in Fig. 2 of Popovic et al.

Furthermore, Applicants submit that even with the combination of the 40058 publication with Popovic et al. proposed by the Examiner, still the claimed invention would not and could not result. In other words, if the leads of the 40058 publication were bent in any direction as proposed by the Examiner, it would not be possible that “each one of the leads has a bend in a direction selected to result in each one of the leads being closer to the first surface of the substrate than to the second surface of the substrate throughout the length of the lead.” as set forth in Claim 1.

As described above, in Claim 1, the claimed first surface of the substrate is recited to be the substrate surface upon which the claimed one or more magnetic field transducer are disposed, and also the surface of the substrate closest to the current conductor. Referring to FIG. 3 of the 40058 publication, the first surface of the substrate 20 is downward. However, leads 22-25 are closest to the other surface, the second surface of the substrate 20. No matter how the leads 22-25 of the 40058 publication are bent, they cannot be closest to the first (downward) surface of the substrate 20 throughout their lengths. The parts of the leads 22-25 of the 40058 publication nearest to the substrate 20 are necessarily nearest to the side of the substrate opposite from the Hall device 35 depicted in FIG. 11.

The claimed arrangement provides an unexpected advantage. Namely, with the claimed arrangement, the current conductor, e.g., 12a and 12b to 12c and 12d (FIG. 1) is comprised of a coupling of leads of the lead frame 12, which requires no separate part and no separate assembly step in the manufacture of an integrated circuit to provide a current conductor. Furthermore, with the substrate 16 being upside-down from a conventional arrangement, the magnetic field transducer 18 can be disposed very close to the narrow portion 14 of the current conductor, resulting in a high sensitivity.

Furthermore, as the Examiner is also aware, and as found in MPEP §2142, in order to establish a prima facie case of obviousness "...there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." Applicants respectfully submit that the Examiner has not met this burden in order to establish prima facie obviousness.

In essence, Applicants submit that any lead bend direction that may or may not be found in Popovic et al., when applied to the 40058 publication, not only cannot result in the claimed invention for the reasons described above, but also results in no advantage to that configuration already set forth in the 40058 publication. Therefore the skilled artisan would have no motivation to modify the configuration shown in the 40058 publication in the way suggested by the Examiner, i.e., by merely bending the leads.

In view of the above, Applicants submit that Claim 1 is patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al.

Claims 4-18 and 36-38 depend from and thus include the limitations of Claim 1. Thus, Applicants submit that Claims 4-18 and 36-38 are patentably distinct over the cited references at least for the reasons discussed above in conjunction with Claim 1.

Applicants submit that Claim 4 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest that the "... current conductor portion further comprises a conductive clip coupled to the at least two of the plurality of leads," as set forth in Claim 4. This claimed arrangement is shown, for example, in FIG. 7, in which a conductive clip 204 couples leads 202a and 202b to leads 202c and 202d, thereby forming a current conductor. The Examiner indicates that the conductive clip can be found in FIG. 9 of the 40058 publication. However, FIG. 9 of the 40058 publication is indicative of a current conductor without any conductive clip.

Claims 5-7 depend from and thus include the limitations of Claim 4. Thus, Applicants submit that Claims 5-7 are patentably distinct over the cited references at least for the reasons discussed above in conjunction with Claim 4.

Applicants submit that Claim 11 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest "... said one or more magnetic field transducers are rotated relative to each other for providing predetermined voltage output polarities," as set forth in Claim 11. The Examiner uses FIG. 10 of the 40058 publication to show this characteristic. However, Applicants can find no reference to rotations or polarities in the 40058 publication.

Applicants submit that Claim 12 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest "... at least a portion of said current conductor portion has a T-shaped cross section," as set forth in Claim 12. As described above, the claimed T-shaped cross section is shown, for example, in FIG. 9A of the present patent application. The Examiner indicates that the claimed T-shaped cross section can be seen in FIG. 9 of the 40058 publication. However, FIG. 9 of the 40058 publication is not a cross-sectional view. Applicants submit that the current conductor 4 of the 40058 publication has a uniform thickness, and therefore, a rectangular cross section, not a T-shaped cross section as claimed.

Applicants submit that Claim 13 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest "... at least a portion of said current conductor portion has a rectangular cross section having a minimum dimension less than a thickness of said lead frame," as set forth in Claim 13. Applicants submit that the current conductor 4 of the 40058 publication has a uniform thickness, and therefore, a rectangular and uniform cross section. The Examiner makes no comment about Claim 13. However, the Examiner asserts that "...it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the thickness of the lead of ...[the 40058 publication] for intended use, since such a modification would have involved a mere change in the size of the leads." Applicants respectfully disagree and submit that the claimed current conductor portion comprises a coupling of at least two of the leads of the claimed lead frame. Therefore, in order to provide the current conductor portion having cross section with a minimum dimension less than a thickness of the lead frame from which it is formed requires more than a mere selection of thickness. Essentially, the lead frame must have at least two thicknesses in order to accomplish the claimed structure.

Claims 32 and 33 depend from and thus include the limitations of Claim 29. Thus, Applicants submit that Claims 32 and 33 are patentably distinct over the cited references at least for the reasons discussed above in conjunction with Claim 29.

For substantially the same reasons described above in conjunction with Claim 1, Applicants submit that Claim 33 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest "... each one of the leads has a bend in a direction selected to result in each one of the leads being closer to the first surface of the substrate than to the second surface of the substrate throughout a length of the lead," as set forth in Claim 33.

Applicants submit that Claim 37 is further patentably distinct over the 40058 publication, whether taken alone or in combination with Popovic et al., since the cited references neither describe nor suggest “...a stud bump disposed to electrically couple said substrate to said lead frame,” as set forth in Claim 37. The Examiner makes no comment about Claim 37.

In view of the above, Applicants submit that the rejection of Claims 1, 4-18, 32, 33, and 36-38 under 35 U.S.C. §103(a) should be removed.

Claim 39 is new in the application. Consideration of new Claim 39 is respectfully requested. Support for this arrangement can be found in many of the figures, for example, in FIG. 1.

In view of the above Remarks, Applicants submit that the claims and the entire case are in condition for allowance and should be sent to issue and such action is respectfully requested.

The Examiner is respectfully invited to telephone the undersigning attorney if there are any questions regarding this Response or this application.

The Assistant Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 500845, including but not limited to, any charges for extensions of time under 37 C.F.R. §1.136.

Dated:

Aug 15, 2007

Respectfully submitted,

DALY, CROWLEY, MOFFORD & DURKEE, LLP

By:

Kermit Robinson

Kermit Robinson

Reg. No. 48,734

Attorney for Applicant(s)

354A Turnpike Street - Suite 301A

Canton, MA 02021-2714

Tel.: (781) 401-9988, Ext. 124

Fax: (781) 401-9966

kr@dc-m.com